

What is claimed is:

1. A method for producing a mechanical resonator with a planar monolithic vibrating structure machined in a crystalline material, characterized in that:

- when the crystalline material is chosen from crystalline materials of trigonal (1) or trigonal (2) or hexagonal structure, this material is cut in the [001] plane or, when it is chosen from materials of cubic structure (silicon excluded), it is cut in the [111] plane, and the 2nd-order vibration mode is then used, or else
- when the crystalline material is chosen from crystalline materials of tetragonal (1) or tetragonal (2) or hexagonal structure, this material is cut in the [001] plane, or, when it is chosen from materials of cubic structure, it is cut in the [001] or [100] plane (silicon excluded) or [010] plane, and the 3rd-order vibration mode is then used,

whereby the resonator exhibits natural material-based frequency isotropy ( $\Delta f_m = 0$ ).

2. A mechanical resonator with a planar monolithic vibrating structure machined in a crystalline material, characterized in that, for the resonator to exhibit material-based frequency isotropy ( $\Delta f_m = 0$ ), the crystalline material is chosen from the following:

- a) a crystalline material of tetragonal (1) or tetragonal (2) structure cut in the [001] plane, the resonator then exhibiting material-based frequency isotropy in the 3rd-order vibration mode;
- b) a crystalline material of trigonal (1) or trigonal (2) structure cut in the [001] plane, the

resonator then exhibiting material-based frequency isotropy in the 2nd-order vibration mode;

5. c) a crystalline material of hexagonal structure cut in the [001] plane, the resonator then exhibiting material-based frequency isotropy in both the 2nd- and 3rd-order vibration modes; and

d) a crystalline material of cubic structure  
- cut in the [111] plane (silicon excluded), the resonator then exhibiting material-based frequency isotropy in the 2nd-order vibration mode

or

- cut in the [001], [100] (silicon excluded) or [010] planes, the resonator then exhibiting material-based frequency isotropy in the 3rd-order vibration mode.